ROUTINE

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

Inspection and Repair for Generic Aircraft Nitrogen Generator (GANG)

Part Number 791600-001, NSN 3655-01-463-3338

Headquarters Department of the Army, Washington, D.C.
30 April 2008

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NOTE

This publication is effective until rescinded or superseded.

1. **PURPOSE.** The purpose of this TB is to inspect and repair all Generic Aircraft Nitrogen Generators (GANG) returning from Operation Enduring Freedom/Iraqi Freedom (OEF/OIF) to determine the need for repair, to incorporate corrections to reported operational problems, and approved configuration changes.

2. **PRIORITY CLASSIFICATION.** ROUTINE.

3. **SUMMARY OF PROBLEM.** Operations in OEF/OIF may have caused serious deterioration to the subject AGSE equipment, which will make necessary cleaning, replacement or repair of component parts.

4. **REFERENCES.** GANG TM 1-3655-230-12, TM 1-3655-230-23P, and TM 1-3655-230-30, including GANG Diesel Engine TM 1-2815-262-13&P, and “Stages of Rust and Corrosion” (Paragraph 10).

5. **TECHNICAL INSPECTION PROCEDURES.** The GANG shall be inspected for damaged, inoperative, broken, deteriorated, missing, or corroded parts and components that adversely affect GANG performance using the enclosed procedures and recorded in accordance with the checklist in Paragraph 11, Table 1. Damaged, missing, or otherwise unserviceable components will be annotated on a DA 2404 (provided at Paragraph 16). Technicians familiar with GANG configurations shall perform the Technical Inspections.

a. OPERATOR PREVENTIVE MAINTENACE CHECKS AND SERVICES (PMCS).

(1) Make sure GANG is free of tools, equipment, fluid leaks (fuel, coolant, engine oil, and hydraulic fluid), dirt, and corrosion.

(2) Check action of the parking brake and set the hand brake to prevent the unit from rolling.

*This publication supersedes TB 1-3655-230-20-1, dated 31 August 2004.

b. EXHAUST.

(1) Make sure exhaust area is clear of obstructions that may be ignited or damaged by the hot exhaust gases.

(2) Examine exhaust system for missing or damaged components.

c. ENCLOSURE AND TRAILER MODULE.

(1) Inspect frame, covers, and panels for dents, cracks, punctures, corrosion, and security. Inspect enclosure for web cracks, delaminations, and structural support cracking or separation. Inspect secure and mounting points of all doors and access covers for cracks and out-of-round holes.

(2) Inspect access doors for damage to determine whether latches and hinges operate properly.

(3) Close the control panel door. Tilt the enclosure up and prop it open with the two support rods to verify operation.

(4) Remove the enclosure.

(5) Determine if the four tie down rings are in place and inspect for damage.

(6) Inspect all mounting and tubing joints and electrical connections to ensure that they are secure, tighten where necessary.

d. ELECTRICAL CONTROLS.

(1) Inspect all control and pressure relief valves, pressure and temperature switches, oxygen sensor, relays, timer, fuses, and programmable logic controller for missing parts, damage, or corrosion.

(2) Inspect all electrical connections to ensure that they are secure, tighten where necessary.

e. CONTROL PANEL.

(1) Inspect switches, meters, gauges, indicators, lights and display for cracked glass, missing parts, damage, or corrosion. Inspect switches for operation and freedom from binding.

(2) Inspect all electrical connections to ensure that they are secure, tighten where necessary.

(3) Ensure that all stencils, data plates, decals, and schematics are legible. Replace questionable items.

f. BATTERY.

(1) Inspect battery and battery hold-downs for damage or corrosion. Note on DA Form 2404 if other than Optima battery is installed. Determine if battery hold-downs are tight.

(2) Ensure battery cables and connectors are in-place and determine whether the cables or connectors are damaged.

g. ENGINE COMPARTMENT.

(1) Inspect lubricating oil level and add as required in accordance with (IAW) TM 1-3655-230-12.

(2) Inspect engine and compartment for missing parts, damage, signs of fluid leaks, dirt, and corrosion.

(3) Inspect air intake and ductwork assembly for punctures, corrosion, and loose mounting screws.

(4) Verify that fluid lines are connected and secure.

(5) Verify that bolts on engine mounts are secure.

(6) Inspect starter assembly to determine if power cables are secure. Inspect all electrical connections to ensure that they are secure, tighten where necessary.

(7) Inspect tension on both belts and adjust as required in accordance with (IAW) TM 1-3655-230-12.

(8) Inspect for evidence of sand downstream of the engine intake air filter.

h. HYDRAULIC SYSTEM.

(1) Inspect hydraulic oil level and add as required IAW TM 1-3655-230-12.

(2) Inspect hydraulic hoses for cuts, splits, fraying, bulging, pinching, delamination, end flaring, or leaks and verify hoses are securely fastened. Cut, split, frayed, bulged, pinched, delaminated, flared, or leaking hoses shall be replaced.

(3) Inspect hydraulic system for missing parts, security, damage, leaks, or loose fittings.

(4) Inspect reservoir gauge, thermometer, and pressure gauge for leaks and cracked or clouded sight glass. Cracked or clouded sight glasses shall be replaced.

(5) Inspect hydraulic filter housing assembly, filter head indicator, and wiring for cracks, damage, or leaks. Cracked or damaged wiring shall be replaced.

(6) Inspect reservoir through the filler neck for evidence of sand or contamination.

i. FEED AIR COMPRESSOR.

(1) Inspect feed compressor system including air intake system for damage, missing parts, leaks, or corrosion.

(2) Inspect all electrical, air, and fluid connections to ensure that they are secure, tighten where necessary.

(3) Inspect oil level and add as required IAW TM 1-3655-230-12. Use only the NSN 9150-01-487-8166 oil as specified in the TM.

j. FILTERS.

(1) Inspect filter system for damage, missing parts, leaks, or corrosion. Inspect magnetic drain plug assemblies (F2 & F3) for proper operation. Inspect F2 and F3 ceramic bowls for cracks. A cracked F2 or F3 ceramic bowl shall be replaced.

(2) Inspect all air and fluid connections to ensure that they are secure, tighten where necessary.

k. MEMBRANE SYSTEM.

(1) Inspect membrane system for damage, missing parts, leaks at other than waste gas exhaust ports, or corrosion.

(2) Inspect all electrical and air connections to ensure that they are secure, tighten where necessary.

l. BOOSTER COMPRESSOR.

(1) Inspect booster compressor system for damage, missing parts, leaks, or corrosion and proper limit switch operation.

(2) Inspect all electrical, air, and fluid connections to ensure that they are secure, tighten where necessary.

m. RADIATOR & HEAT EXCHANGERS.

(1) Inspect coolant level and add as required IAW TM 1-3655-230-12.

(2) Inspect coolant hoses for cuts, splits, fraying, bulging, pinching, delamination, end flaring, or leaks and verify hoses are securely fastened. Cut, split, frayed, bulged, pinched, delaminated, flared, or leaking hoses shall be replaced..

(3) Inspect radiator/heat exchangers/oil cooler for damage, missing parts, leaks, or corrosion. Inspect tubes to ensure that they are not rubbing against another part or structure.

(4) Inspect cooling water system for damage, missing parts, leaks, or corrosion.

n. TRAILER AND RUNNING GEAR.

NOTE

Minor dents on components that do not affect the serviceability are acceptable.

(1) Inspect axle assemblies and running gear for cracked or dented housing; bent, missing, or damaged components; loose or missing fasteners; damaged or missing lubrication fittings; and leaks.

(2) Remove brake drums and inspect service brakes. Check brake lining to ensure a minimum thickness of 3/32 inch is remaining above rivet head or of bonded lining. Lining shall show no evidence of cracking, oil, or grease. Brake backing plates and related parts shall be properly mounted, free of bends and distortion.

(3) Inspect brake drums. Brake drums shall not be cracked or distorted. Scores on drum braking surfaces that reduce lining-to-drum contact more than 10 percent are not acceptable. Refinished drums that are machined to maximum allowable diameter are acceptable if remaining scores do not exceed 1/32 inch in width or 1/64 inch in depth. “Oversize” drums shall be stamped on outer face of drum just above and between two studs on finished drums. Linings shall not be shimmed. New shoes and lining assemblies, if required, shall be used on both brakes of the same axle, using the same brake lining composition. Drums must be matched per axle and will be checked and serviced in accordance with the applicable TM.

(4) Axle tubes shall be free of breaks and cracks, radius rods shall be straight, and rubber

bushings shall be serviceable. Weather checked rubber grommets are acceptable. Axle spindle threads shall be free of wear, cross threads or damage. Axle spindles shall be free of bends and damaged bearing seats. Drawbar assembly shall be free of bends, breaks, cracks, and other damage.

(5) Inspect tires and wheels for condition (excessive wear, cuts, or foreign objects). Check that each tire has 3/16 inch or more of tread remaining, and is in good serviceable condition. Check that all tires on a vehicle are matched to provide proper performance and approximately equal life. Tires will not show evidence of cupping or chunking. Check that tires do not have cuts or cracks and that the air inflation pressures are equal. Inspect for rubber separation or bulges on tire sidewalls. Inspect wheels for missing lug nuts. Determine whether wheels are free of cracks, breaks and damaged mounting holes. Inspect tire and wheel assemblies for warpage and run out, replace as required.

(6) Inspect brake assembly for missing or loose hardware and conditions indicating improper operation. Verify that the handbrake assembly is complete with all linkage, in a serviceable condition, and properly adjusted.

(7) Inspect fuel tank and hydraulic reservoir for cracked or dented housing; bent, missing, or damaged components; broken, loose, or missing connections; and leaks.

o. HIGH PRESSURE CYLINDERS AND HOSE REELS.

(1) Inspect gas cylinders IAW TO 42B5-1-2. All cylinders will have the 5-year hydrostatic inspection certification completed to establish a baseline. Any tanks that fail will be replaced.

(2) Record date cylinders were last tested in logbook.

(3) Inspect hose reels for cuts, splits, leaks, missing parts, or damage and verify hoses are securely fastened.

p. FUEL TANK.

(1) Inspect fuel tank for evidence of sand or contamination through the fuel filler neck.

(2) Inspect fuel system for missing parts, security, damage, leaks, or loose fittings.

q. ELECTRICAL CHECKS.

(1) Connect battery and switch the control panel main circuit breaker (CB1) ON.

(2) Push To Test and verify that Purity light illuminates. Check that Percent Nitrogen Display (AE1) reads between 77 to 81%.

(3) Switch the two panel light switches ON and verify that the three panel lights illuminate. Ensure panel light ground.

(4) Determine whether reading on FUEL gauge is functioning properly.

(5) Switch the control panel main circuit breaker (CB1) OFF.

6. **FUNCTIONAL INSPECTION PROCEDURES.** The functional performance of the GANG shall be assessed using the following procedure and recorded in accordance with the checklist in paragraph 12, Table 2. The functional inspection shall be performed after the Technical Inspection. All findings noted during the Technical Inspection that are required for safe operation of the GANG shall be corrected prior

to performing the functional inspection. The GANG must start; operate; and produce high pressure (4400 psig), minimum 95.5% pure nitrogen to perform a full functional inspection. If the GANG is not fully functional, the GANG must be repaired prior to the start of the functional inspection.

a. Place the GANG in operation IAW WP 005, Paragraphs 16 and 17 of TM 1-3655-230-12.

(1) Listen for abnormal sounds, exhaust smoke, knocks, or other signs of wear.

(2) Observe all meters for movement.

(3) Remove GANG from operation IAW WP 005, Paragraph 27 of TM 1-3655-230-12.

(4) Inspect GANG for oil, hydraulic, and fuel leaks.

(5) Start the GANG and allow the GANG to run for a minimum of 2 minutes. Verify operation of the emergency shut down system IAW WP 005, Paragraph 28 of TM 1-3655-230-12.

(6) Start the GANG and allow the GANG to run for a minimum of 2 minutes. Verify operation of the fault safety shut down systems IAW WP 005, Paragraph 28.1 of TM 1-3655-230-12.

b. Place the GANG in operation IAW WP 005, Paragraph 30 of TM 1-3655-230-12 and complete testing. Inspect GANG for air, oil, hydraulic, and fuel leaks.

(1) Verify that the GANG pressurized number 1 cylinder from 1 to 4000 psig of 95.5% purity nitrogen within 60 minutes of starting the diesel engine.

(2) Verify that the GANG pressurized number 2 cylinder from 1 to 4000 psig of 95.5% purity nitrogen within 85 minutes of starting the diesel engine.

7. APPLICATION. This TB shall be applied to all GANG returning from OEF/OIF.

8. MAINTENANCE REQUIREMENTS.

a. PAINT. The GANG shall have a final topcoat of CARC paint in accordance with MIL-DTL-53072. Color shall be SAND 33303 unless otherwise specified by PM AGSE.

b. DATA PLATES. All data plates, decals and schematic diagrams shall be legible. Replace questionable items.

(1) An additional data plate shall be riveted to the GANG that contains the following data. This data plate shall be affixed adjacent to the GANG cylinder test tag.

(a) RESET by: “facility name”.

(b) Diesel Engine serial number.

(c) Date of the RESET.

(d) Hour meter reading after final test.

(e) MWO 1-3655-230-50-1, 9 April 2007.

c. MODIFICATION WORK ORDERS (MWO). No MWO shall be applied under authority of this TB. Concurrent MWO application may be applied as directed by the AGSE Project Office.

d. SEAL AND GASKET LEAKAGE. There shall be no leakage permitted unless otherwise specified herein or in the TMs.

e. MANDATORY REPLACEMENT PARTS. See paragraph 13, Table 3, for the Mandatory Replacement Parts Lists. Locking devices (such as lock washers, lock nut, etc.), gaskets, seals, and o-rings that are removed shall not be re-used and shall be replaced.

f. BASIC ISSUE ITEMS (BII). No BII shall be provided.

g. HARDWARE. Hardware shall be replaced if broken. Hardware may be reconditioned/re-used or equal or greater value hardware substituted if the material is not readily available through the supply channels as long as material meets all MIL specifications and drawings. Hardware that exhibit signs of deplating or corrosion shall be reconditioned or replaced.

h. CORROSION AND PAINTING (See paragraph 10). New internal items that are replacement items shall not be repainted. Access doors, covers, panels, and the control box shall only be disassembled as necessary to facilitate any repair. Damaged and corroded items shall only be disassembled to a level where repairs can be made. Replacement of items or next higher assembly may be an option. Interior surfaces shall only be cleaned and shall not be repainted unless an item has been repaired. The repaired surface(s) then shall be spot painted. Stage 1 and 2 rust on interior surfaces is acceptable and shall not require a repair or paint with the exception that no corrosion is acceptable on any sealing or electrical surface or contact. Exterior surfaces shall be painted with CARC paint IAW MIL-DTL-53072; color shall be SAND 33303 unless otherwise specified by Program Office.

i. PERIODIC MAINTENANCE FOR THE GANG.

Perform all Periodic Maintenance required IAW WP 006, Table 2 of TM 1-3655-230-12 for 250, 500, 1000, and 2000 hours periods plus 6 and 12 months periods.

j. ENCLOSURE AND TRAILER MODULE.

(1) Repair enclosure as required. Repair of fiberglass enclosure shall be performed IAW TM 9-2320-280-34, Fiberglass Repair.

(2) Repair any welds or broken attaching hardware to frame and or housing as required.

(3) Clean and inspect all sub-structure and mounting points for sub-components. Ensure operation of the warming door and upper and lower baffles.

(4) Rivet all presently glued latches to doors.

k. BATTERY.

(1) Only Optima battery NSN 6140-01-374-2243 shall be installed; if a battery other than this Optima battery is installed, it shall be removed and replaced. The Optima 12-volt batteries will be:

a) Inspected for terminal integrity, cracks, bulging or swelling of the battery case, and other damage.
b) Recharged to a resting voltage (after the surface charge has worn off) of 12.7 volt minimum.
c) Verify cold cranking amps using a Midtronics Model ED-18 Electrical System Analyzer (or equivalent). A printout for all passing batteries shall be provided; a number shall be marked on the printout and matching number marked on the battery.

d) Hot water washed with soap to remove dirt and grease.
e) Inspected for terminal integrity, cracks, bulging or swelling of the battery case, and other damage.
f) Clean terminal post with terminal brush.

(2) Batteries will be replaced if required, or if adequate testing equipment is not available. Cables, terminals, and terminal lugs shall be replaced on an as required basis. Recondition or replace battery hold down assemblies as necessary.

(3) Battery shall be installed IAW TM or may be installed over the hydraulic reservoir (latest configuration).

l. EXHAUST.

Clean, repair, or replace as required.

m. FUEL TANK.

(1) Flush and clean fuel tank.

(2) All o-rings and gaskets that are removed shall be replaced. All filters shall be replaced. The seal on the fuel cap shall be replaced. All hoses shall be inspected and replaced as required.

n. ELECTRICAL CONTROLS & CONTROL PANEL.

(1) Replace light bulbs as required.

(2) Inspect controls, gauges, and instruments for proper operation and replace as required.

(3) Check Receiver 1 (P18) and Receiver 2 (P19) pressure gauges against a calibrated instrument to ensure correct operation. Gauges shall read within ± 2.5% of the calculated instrument.

(4) The guard on the purity override switch shall be safety-wired (0.020”) in the closed position.

(5) Control Panel labels shall be applied as specified by the Program Office.

(6) All cables and harnesses shall be cleaned and inspected in-place, then repaired or replaced as needed. Connectors and terminal ends shall be cleaned or replaced if any corrosion is observed. Replacement wires shall be marked with wire numbers, routed along, and neatly attached to the existing harness. Replace missing or damaged terminal lugs. Lightly pull all wire splices to verify physical integrity.

o. ENGINE.

(1) Replace fluid and filters. Thermostat shall be replaced. Inspect hoses for cuts, splits, fraying, bulging, pinching, delamination, end flaring, or leaks, and verify hoses are securely fastened. Cut, split, frayed, bulged, pinched, delaminated, flared, or leaking hoses shall be replaced. Fan belts shall be inspected and show no evidence of deterioration, cracks, cuts, fraying, or damage; belts exhibiting these deficiencies shall be replaced.

(2) Engine mounts shall be inspected and replaced as required; however, if any mount requires replacement, all four shall be replaced with the upgraded mount, NSN 5342-00-882-6903.Inspect fan for cracking. Inspect fan pulley and spacers for damage. Replace items as required

(3) Engines that have evidence of sand downstream of the intake air filter shall be rebuilt IAW paragraph 15. The hour meter shall be replaced on engines that have been remanufactured.

(4) Units that are fully functional, and that have no evidence of sand downstream of the engine intake air filter, shall be compression tested IAW TM1-2815-262-13&P. The engine shall be acceptable if minimum compression in any one cylinder is 405 psig and maximum cylinder variation is 20 psig.

(5) On units that failed the compression test above, a Dynamometer Requalification Performance Test shall be performed IAW the test procedure listed below. At a minimum, the engines must meet or exceed 95% of rated 52.3 HP at rated speed, load, temperatures, and pressures. Valve adjustment, injection timing, and/or component replacement may be required to successfully pass the test. A dynamometer test sheet shall be completed for each engine serial number. Engines that fail requalification testing shall be rebuilt IAW paragraph 15. A dynamometer check is required on the two pilot program GANGs. After analysis of the data on these systems and the data on an additional 6-8 engines that will be preformed by PM AGSE, actual dynamometer criteria will be re-evaluated and adjusted if required.

(6) Dynamometer Requalification Test Run Profile: Start engine and run at loads and speeds shown below for the time limits given.

(a) Idle at no load for 2 minutes.

(b) Fast idle at no load for 3 minutes.

(c) Rated speed at ½ load for 60 minutes.

(d) Rated speed at ¾ load for 40 minutes.

(e) Rated speed at full load for 15 minutes.

(f) Run engine 2 minutes at rated speed rpm with no load before shutdown.

(7) Measure and record oil pressure, oil temperature, water temperature, speed, and torque during each interval.

(8) Fluid Seal and Gasket Leakage. There shall be no leakage permitted. Leaks shall be repaired as required.

(9) For statistical information, the above Dynamometer Requalification Performance Test shall be conducted on all pilot program and rotable pool assets.

p. HYDRAULIC SYSTEM.

(1) The Hydraulic System shall be inspected and repaired IAW TM 1-3655-230-12 and TM 1-3655-230-30.

(2) Replace all filters IAW TM 1-3655-230-12 and TM 1-3655-230-30.

(3) Inspect hydraulic hoses for cuts, splits, fraying, bulging, pinching, delamination, end flaring, or leaks, and verify hoses are securely fastened. Cut, split, frayed, bulged, pinched, delaminated, flared, or leaking hoses shall be replaced.

(4) The fluid shall be replaced IAW TM 1-3655-230-12 with MIL-H-83282 hydraulic oil.

(5) Flush and clean reservoir.

(6) The Hydraulic Oil Cooler shall be acid-dipped, reverse flushed, fins straightened, pressure-tested at 60 psig, repaired as necessary, and shall be clear-coat painted.

(7) Class one leak at hydraulic reservoir filler neck is acceptable.

q. FEED AIR COMPRESSOR.

(1) The Compressor System shall be inspected and repaired IAW TM 1-3655-230-12 and TM 1-3655-230-30.

(2) The fluid, NSN 9150-01-487-8166, shall be replaced IAW TM 1-3655-230-12.

(3) Drain valve, V11, shall be safety-wired (0.032”) in the closed position.

(4) Shop air quick-disconnect NSN 4730-00-511-0794 shall be installed, replace as required.

r. FILTERS.

Replace all filters IAW TM 55-3655-230-12 and TM 1-3655-230-30.

s. MEMBRANE SYSTEM.

The Membrane System shall be inspected and repaired IAW TM 1-3655-230-12 and TM 1-3655-230-30.

t. BOOSTER COMPRESSOR.

(1) The Compressor System shall be inspected and repaired IAW TM 1-3655-230-12 and TM 1-3655-230-30.

(2) The hour meter shall be replaced on compressors that have been overhauled.

(3) The nitrogen heat exchanger cooling tubes water jacket shall be externally inspected for corrosion, damage, and pinching, and afterward flushed...

u. RADIATOR & HEAT EXCHANGER.

(1) The engine and heat exchanger coolant radiator shall be cleaned, inspected, rodded, fins straightened, repaired as necessary, pressure-tested at 15 psig, and painted or the radiator shall be replaced. Radiator caps shall be replaced to ensure integrity of pressure relief limit.

(2) Inspect heat exchanger cooling water pump for damage and operation, overhaul or replace as required. If not presently installed, replace the cooling water pump with the upgrade pump, NSN 4320-01-496-6058.

(3) The fluid shall be replaced IAW TM 1-3655-230-12.

v. TRAILER & RUNNING GEAR.

(1) Remove brake drums and inspect service brakes. Check brake lining to ensure a minimum thickness of 3/32 inch is remaining above rivet head or of bonded lining. Lining shall show no

evidence of oil or grease. Brake backing plates and related parts shall be properly mounted, free of bends and distortion.

(2) Inspect brake drums. Brake drums shall not be cracked or distorted. Scores on drum braking surfaces that reduce lining-to-drum contact more than 10 percent are not acceptable. Refinished drums that are machined to maximum allowable diameter are acceptable if remaining scores do not exceed 1/32 inch in width or 1/64 inch in depth. “Oversize” drums shall be stamped on outer face of drum just above and between two studs on finished drums. Linings shall not be shimmed. New shoe’s and lining assemblies, if required, shall be used on both brakes of the same axle, using the same brake lining composition. Drums must be matched per axle and will be checked and serviced in accordance with the applicable TM.

(3) Grease and properly adjust wheel bearings.

(4) Inspect tires and wheels for condition (excessive wear, cuts, or foreign objects). Check that each tire has 3/16 inch or more of tread remaining, and is in good serviceable condition. Check that all tires on an axle are matched to provide proper performance and approximately equal life. Tires will not show evidence of cupping or chunking. Check that tires do not have cuts or cracks and that the air inflation pressures are equal. Inspect for rubber separation or bulges on tire sidewalls. Tires shall be replaced as required with NSN 2610-00-755-6993. Inspect wheels for missing lug nuts. Determine whether wheels are free of cracks, breaks and damaged mounting holes. Inspect tire and wheel assemblies for warpage and run out, replace as required.

(5) Any GANG that is inducted without a pintle tow hook installed shall not have a tow hook installed on that unit.

(6) Inspect axles to determine whether original or the upgraded axle is installed. In any instance that the upgraded axle is not installed, contact AGSE Logistics Chief for disposition. Replacement of non-upgraded axle is not authorized under this TB unless the upgraded axle is installed, but fails the inspection criteria.

w. RELIEF VALVES & NITROGEN TUBES.

(1) RV1 relief valve shall be cleaned/serviced IAW TM 1-3655-230-12, WP 006.

(2) RV1 and RV3 shall be adjusted IAW TM 1-3655-230-12, WP 006. All other relief valves shall be removed and have their cracking pressures bench checked.

(3) All tubes that are removed shall be inspected, cleaned as required, then immediately sealed and capped or reinstalled.

x. HIGH PRESSURE CYLINDERS & HOSE REELS.

(1) The high pressure system shall be inspected and serviced IAW TM 1-3655-230-12, TM 1-3655-230-30, and TO 42B5-1-2.

(2) Cylinders with less than 5 years life remaining shall be pressure tested IAW TM 1-3655-230-30, WP 009.

(3) Cylinder pressure test date shall be stamped on cylinder test tag. The cylinder test tag shall be relocated to the rear panel and placed approximately in the center of the panel and 2.5 inches from the top of the panel. The tag shall be riveted to the panel.

(4) The hose reels shall be inspected and repaired or replaced IAW TM 1-3655-230-12 and TM

1-3655-230-30. The high and low pressure hoses shall be inspected and replaced as required.

(5) Perform rear panel removal and rework IAW TM 1-3655-230-12, WP 006.

y. TESTING. Testing of the completed GANG will be as follows (complete test sheet IAW Paragraph 14, Table 4, Final Acceptance Test Procedure or equivalent):

(1) Place the GANG in operation IAW WP 005, Paragraphs 16 and 17 of TM 1-3655-230-12.

(2) Listen for abnormal sounds, air leaks, knocks, or other signs of wear.

(3) Observe all meters for movement.

(4) Remove GANG from operation IAW WP 005, Paragraph 27 of TM 1-3655-230-12.

(5) Inspect GANG for oil, coolant, hydraulic, and fuel leaks.

(6) Start the GANG and allow the GANG to run for a minimum of 2 minutes. Verify operation of the emergency shut down system IAW WP 005, Paragraph 28 of TM 1-3655-230-12.

(7) Start the GANG and allow the GANG to run for a minimum of 2 minutes. Verify operation of the three fault safety shut down systems IAW WP 005, Paragraph 28.1 of TM 1-3655-230-12.

(8) Other testing IAW paragraph 14, Table 4 (Final Acceptance Test Procedure).

(9) A nitrogen sample shall be taken from the cylinder and analyzed for nitrogen, water, and total hydrocarbon content. Acceptance shall be a minimum of 95.5% nitrogen and limits of 23.6 ppm of water and 50 ppm of hydrocarbon.

z. PREPARATION FOR SHIPMENT. Prepare GANG for shipment IAW TM 1-3655-230-12. Confirm battery cables are disconnected before shipment.

aa. SOLDERING. Soldering shall be performed IAW the applicable TM, military specification, manufacturer drawing, or industry standard.

bb. ELECTRICAL CONNECTIONS. Electrical connections shall be made IAW the applicable TM, military specification, manufacturer drawing, or industry standard.

cc. PAPER/ELECTRONIC DOCUMENTATION.

(1) Paperwork; such as shop travelers, final inspection records, checklists, tags, test sheets; shall be used to document all processes, procedures, testing, and inspections specified and performed herein. A single document can cover one or multiple items. The original paperwork shall be maintained at the RESET facility for two years.

(2) A logbook for each GANG shall be established IAW DA PAM 738-751.

(3) The repair facility shall establish and maintain a database to include, but not be limited to, the following information:

(a) Fielding location by GANG serial number and unit identification code (UIC).

(b) Engine status, i.e., overhauled, dynamometer or compression tested.

(c) All critical hour gauge readings, e.g., engine hours at time of fielding.

(d) Storage tank (cylinder) hydrostatic test date.

(4) The repair facility shall submit a monthly report to the PM AGSE and PM Reset, identifying the GANG units reset.

dd. QUALITY ASSURANCE. Both below inspections shall be noted on the Final Test Sheet, paragraph 14, Table 4 (Final Acceptance Test Procedure).

(1) Perform an in-process inspection before the enclosure is installed.

(2) After PMCS, testing, and painting have been completed, perform a quality assurance final inspection. Inspect test data sheets and all the parts, components, and problems identified in the Technical and Functional Inspection Checklists; repair as needed. Perform Operator and Unit PMCS inspections.

9. SUPPLY/PARTS AND DISPOSITION. Primary supply transactions will be done via Military Standard Requisitioning and Issuing Procedures (MILSTRIP) according to requirements in TM 1-3555-230-23P. Reset activity will use local procedure for issue and turn in of parts based on Source, Maintenance and Recoverability (SMR) codes. Reset site will establish demand history whenever the repair part requirement is satisfied from a source other than MILSTRIP (controlled substitution, local purchase, bench test to determine serviceability, or local rebuild program). All demands will be captured through the submission of Document Identifier Code (DIC) "DHAs", which act as a signal to the Source of Supply (SOS) that the demand was satisfied by some other means. The Reset site will develop a program to track the document numbers and the submission of DIC "DHAs" on a monthly basis in order to reflect the actual monthly demand history according to actual GANG Reset throughput for each month. This "DHA" document register will be maintained in spread sheet format and submitted to AGSE PM and Reset PM Logistics Chiefs on the 15th of each month. The submission will be complete record from beginning of program. At a minimum, it will include NSN, document number, quantity and GANG SN. Reset site will report the complete repair parts usage data by GANG serial number 15 days after the completion of each GANG to Reset PM.

10. STAGES OF RUST AND CORROSION.

a. As an aid in evaluating rust damage and planning rust repair actions, rust shall be classified into four stages:

(1) Stage 1 – Red, black, or white corrosion deposits on surface accompanied by minor etching and pitting. Base metal is sound.

(2) Stage 2 – Powered, granular and scaled condition resulting in erosion of material from the surface. Base metal is sound.

(3) Stage 3 – Surface condition and corrosion deposits are similar to Stage 2, except that metal in the corroded areas is unsound and small pinholes may be present.

(4) Stage 4 – Corrosion has advanced to a point where the surface has been penetrated. No metal remains at point of severest corrosion. There are rust holes in the surface area, or metal is completely missing along the edge.

b. Exterior surfaces of units with areas of Stage 1 or Stage 2 rust shall be blasted, cleaned, treated, primed, and painted. Units with areas of Stage 3 or Stage 4 rust shall be repaired, cleaned, treated, primed, and painted in those areas or should have assemblies replaced with new assemblies if repair is not economical.

c. Any evidence of corrosion on working surfaces of close tolerance parts is not acceptable. Pitting or surface deterioration in the area of any seal or gasket is not acceptable if it affects the proper functioning and/or proper performance of the applicable component.

11. **TECHNICAL INSPECTION CHECKLIST.**

Table 1. Technical Inspection Checklist

	Technical Inspection	Condition
1	Make sure GANG is free of tools, equipment, fluid leaks (fuel, engine oil, antifreeze, compressor oil, and hydraulic fluid), dirt, and corrosion.	
2	Set parking brake.	
3	Make sure area by exhaust is clear of obstructions that may be ignited or damaged by the extremely hot exhaust gases.	
4	Examine exhaust system for missing or damaged components.	
5	Inspect frame, covers, and panels for dents, cracks, punctures, corrosion, and security. Inspect enclosure for web cracks, delaminations, and structural support cracking or separation. Inspect secure and mounting points of all doors and access covers for cracks and out-of-round holes.	
6	Inspect access doors for damage to determine whether latches and hinges operate properly.	
7	Close the control panel door. Tilt the enclosure up and prop it open with the two support rods to verify operation.	
8	Remove the enclosure.	
9	Determine if the four tie down rings are in place and inspect for damage.	
10	Inspect all mounting and tubing joints and electrical connections to ensure that they are secure, tighten where necessary.	
11	Inspect all control and pressure relief valves, pressure and temperature switches, oxygen sensor, relays, timer, fuses, and programmable logic controller for missing parts, damage, or corrosion.	
12	Inspect all electrical connections to ensure that they are secure, tighten where necessary.	
13	Inspect switches, meters, gauges, indicators, and display for cracked glass, missing parts, damage, or corrosion. Inspect switches for operation and freedom from binding.	
14	Inspect all electrical connections to ensure that they are secure, tighten where necessary.	

Table 1. Technical Inspection Checklist (Continued)

	Technical Inspection	Condition
15	Ensure that all stencils, data plates, decals, and schematics are legible. Replace questionable items (see paragraph 8.b.).	
16	Inspect battery and battery hold-downs for damage or corrosion. Note on 2404 if other than Optima batteries are installed and replace battery with Optima battery. Determine if battery hold-downs are tight.	
17	Ensure battery cables and connectors are in-place and determine whether the cables and/or connectors are damaged.	
18	Inspect lubricating oil level and add as required in accordance with (IAW) TM 1-3655-230-12.	
19	Inspect engine and compartment for missing parts, damage, signs of fluid leaks, dirt, and corrosion.	
20	Inspect air intake and ductwork assembly for punctures, corrosion, and loose mounting screws.	
21	Verify that fluid lines are connected and secure.	
22	Verify that bolts on engine mounts are secure.	
23	Inspect starter assembly to determine if power cables are secure. Inspect all electrical connections to ensure that they are secure, tighten where necessary.	
24	Inspect tension on both belts and adjust as required in accordance with (IAW) TM 1-3655-230-12.	
25	Inspect for evidence of sand past the engine intake air filter.	
26	Inspect hydraulic oil level and add as required IAW TM 1-3655-230-12.	
27	Inspect hydraulic hoses for cuts, splits, or leaks and verify hoses are securely fastened.	
28	Inspect hydraulic system for missing parts, security, damage, leaks, or loose fittings.	
29	Inspect reservoir gauge, thermometer, and pressure gauge for leaks and cracked glass.	
30	Inspect hydraulic filter housing assembly, filter head indicator, and wiring for cracks, damage, or leaks.	
31	Inspect reservoir for evidence of sand or contamination through the filler neck.	

Table 1. Technical Inspection Checklist (Continued)

	Technical Inspection	Condition
32	Inspect feed compressor system including air intake system for damage, missing parts, leaks, or corrosion.	
33	Inspect all electrical, air, and fluid connections to ensure that they are secure, tighten where necessary.	
34	Inspect oil level and add as required IAW TM 1-3655-230-12. Use only the oil as specified in the TM.	
35	Inspect filter system for damage, missing parts, leaks, or corrosion. Inspect magnetic drain plug assemblies (F2 & F3) for proper operation. Inspect F2 and F3 ceramic bowls for cracks; replace if cracked.	
36	Inspect all electrical, air, and fluid connections to ensure that they are secure, tighten where necessary.	
37	Inspect membrane system for damage, missing parts, leaks, or corrosion. Repair or replace as necessary.	
38	Inspect all electrical and air connections to ensure that they are secure, tighten where necessary.	
39	Inspect booster compressor system for damage, missing parts, leaks, or corrosion.	
40	Inspect all electrical, air, and fluid connections to ensure that they are secure, tighten where necessary.	
41	Inspect radiator coolant level and add as required IAW TM 1-3655-230-12.	
42	Inspect coolant hoses for cuts, splits, fraying, bulging, pinching, delamination, end flaring, or leaks, and verify hoses are securely fastened. Cut, split, frayed, bulged, pinched, delaminated, flared, or leaking hoses shall be replaced.	
43	Inspect radiator/heat exchanger/oil cooler for damage, missing parts, leaks, or corrosion. Inspect tubes to ensure that they are not rubbing against another part or structure.	
44	Inspect cooling water system for damage, missing parts, leaks, or corrosion.	
45	Inspect axle assemblies and running gear for cracked or dented housing; bent, missing, or damaged components; loose or missing fasteners; damaged or missing lubrication	

Table 1. Technical Inspection Checklist (Continued)

	Technical Inspection	Condition
	fittings, and leaks.	
46	Remove brake drums and inspect service brakes. Check brake lining to ensure a minimum thickness of 3/32 inch is remaining above rivet head or of bonded lining. Lining shall show no evidence of oil or grease. Brake backing plates and related parts shall be properly mounted, free of bends and distortion.	
47	Inspect brake drums. Brake drums shall not be cracked or distorted. Scores on drum braking surfaces that reduce lining-to-drum contact more than 10 percent are not acceptable. Refinished drums that are machined to maximum allowable diameter are acceptable if remaining scores do not exceed 1/32 inch in width or 1/64 inch in depth. Drums must be matched per axle.	
48	Axle tubes shall be free of breaks and cracks, radius rods shall be straight, and rubber bushings shall be serviceable. Weather checked rubber grommets are acceptable. Axle spindle threads shall be free of wear, cross threads or damage. Axle spindles shall be free of bends and damaged bearing seats. Drawbar assembly shall be free of bends, breaks, cracks, and other damage.	
49	Inspect tires and wheels for condition (excessive wear, cuts, or foreign objects). Check that each tire has 3/16 inch or more of tread remaining, and is in good serviceable condition. Check that all tires on a vehicle are matched. Tires will not show evidence of cupping or chunking. Check that tires do not have cuts or cracks. Inspect for rubber separation or bulges on tire sidewalls. Inspect wheels for missing lug nuts. Determine whether wheels are free of cracks, breaks and damaged mounting holes. Inspect tire and wheel assemblies for warpage and run out, replace as required.	
50	Inspect brake assembly for missing or loose hardware and conditions indicating improper operation. Verify that the handbrake assembly is complete with all linkage, in a serviceable condition, and properly adjusted.	

Table 1. Technical Inspection Checklist (Continued)

	Technical Inspection	Condition
51	Inspect fuel tank and hydraulic reservoir for cracked or dented housing; bent, missing, or damaged components; broken, loose, or missing connections; and leaks.	
52	Inspect gas cylinders IAW TO 42B5-1-2.	
53	Record date cylinders were last tested.	TESTED DATE _____
54	Inspect hoses and hose reels for cuts, splits, fraying, bulging, pinching, delamination, end flaring, or leaks, and verify hoses are securely fastened.	
55	Inspect fuel tank for evidence of sand or contamination through the fuel filler neck.	
56	Inspect fuel system for missing parts, security, damage, leaks, or loose fittings.	
57	Connect batteries and switch the control panel main circuit breaker (CB1) ON.	
58	Push To Test and verify that Purity light illuminates. Check that Percent Nitrogen Display (AE1) reads between 77 to 81%.	
59	Switch the two panel light switches ON and verify that the three panel lights illuminate.	
60	Determine whether reading on FUEL gauge is functioning properly.	
61	Switch the control panel main circuit breaker (CB1) OFF.	

12. FUNCTIONAL INSPECTION CHECKLIST.

Table 2. Functional Inspection Checklist

	Functional Inspection	Condition
1	Place the GANG in operation IAW WP 005, Paragraphs 16 and 17 of TM 1-3655-230-12.	
2	Listen to engine for abnormal sounds, air leaks, knocks or other signs of wear.	
3	Observe all meters for movement.	
4	Remove GANG from operation IAW WP 005, Paragraph 27 of TM 1-3655-230-12.	
5	Inspect GANG for oil, hydraulic, coolant, and fuel leaks.	
6	Start the GANG and allow the GANG to run for a minimum of 2 minutes. Verify operation of the emergency shut down system IAW WP 005, Paragraph 28 of TM 1-3655-230-12.	
7	Start the GANG and allow the GANG to run for a minimum of 2 minutes. Verify operation of the fault safety shut down system IAW WP 005, Paragraph 28.1 of TM 1-3655-230-12.	
8	Place the GANG in operation IAW WP 005, Paragraph 30 of TM 1-3655-230-12 and complete testing. Inspect GANG for air, oil, coolant, hydraulic, and fuel leaks. (1) Verify that the GANG pressurized number 1 cylinder from 1 to 4000 psig of 95.5% purity nitrogen within 60 minutes of starting the diesel engine. (2) Verify that the GANG pressurized number 2 cylinder from 1 to 4000 psig of 95.5% purity nitrogen within 85 minutes of starting the diesel engine.	Start time _____ Cyl #1 filled time _____ Minutes=_____ Cyl #2 filled time _____ Minutes=_____

13. **MANDATORY REPLACEMENT PARTS LIST.**

Table 3. Mandatory Replacement Parts List

DESCRIPTION	PART NUMBER	NSN	QTY
Fuel separator filter element, F6	R12P	4330-01-435-7402	1
Engine oil filter		4330-01-450-4697	1
Engine fuel filter		2910-01-454-7635	1
Engine/feed compressor inlet air filter, F1	791991-001	4330-01-478-7542	1
Compressor oil filter element, F7		2940-01-338-3951	1
Pressure gauge 0-3000, PI10		6685-01-478-4237	1
Thermostat	897211-2090	6685-01-480-1374	1
Filter element, 7 micron, F4		4330-00-138-5478	1
N2 water separator filter F2	792253-001	4330-01-479-1012	1
N2 coalescing filter F3	792254-001	4330-01-478-7843	1
Feed air compressor oil separator filter F8	39900923	4310-01-469-1891	1
Hyd filter, 10 micron, F5	791862-001	2940-01-479-8459	1
Oxygen sensor AE1	C06689-B3	6116-01-369-7679	1
Carbon absorber cartridge, A1	791881-001	4330-01-478-8507	1
Strainer, hyd, S1		4730-01-444-3996	1
Axle grease seal	6311	5330-00-631-6649	4
Fuel cap gasket (CAGE 79146)	600081	none	1
Hose Chuck assy copper washer		5310-00-793-1456	2
Gasket, cover, access- hyd tank		5330-01-528-7901	1
O-ring, carbon absorber		5331-01-211-1496	1
O-ring, carbon absorber		5331-00-585-7487	1
O-ring, bowl, hyd filter		5331-01-112-6127	1

14. **FINAL TEST SHEET.**

Table 4. FINAL ACCEPTANCE TEST PROCEDURE: Self Generating Nitrogen Servicing Cart (GANG) Part Number 791600-001, NSN 3655-01-463-3338

1.0 INTRODUCTION

1.1 Test Objective

To demonstrate that a GANG is physically and functionally operational and document end item final inspection and acceptance by the Government.

1.2 Test Purpose

To determine that the RESET GANG was properly repaired; that inherent safety devices are correctly installed and operate as required; and that the unit will produce nitrogen as required.

2.0 TEST REQUIREMENTS

2.1 Test Specimen

GANG Part Number 791600-001	GANG S/N:
Starting Engine Hour Meter:	Final Engine Hour Meter:
Starting Booster Compressor Hour Meter:	Final Booster Compressor Hour Meter:

3.0 STATIC INSPECTION

3.1 PRE-OPERATIONAL PREPARATION

3.1.1 Ensure that all shop paperwork is complete before testing. Review any open paperwork with the Production Manager to assure that there is no adverse affect on test results.

4.0 FUNCTIONAL OPERATION

4.1 FUEL SYSTEM

_____ (1) Fill fuel tank with approximately 5 gallons of fuel and verify fuel gauge reads approximately ¼ full.

_____ (2) Inspect all tank seams and fittings for leaks.

4.2 PRE-START PROCEDURE

_____ (1) Verify the outer doors are closed and latched, except where necessary to operate or perform test sequence.

_____ (2) Set hand brake.

_____ (3) Make sure area by exhaust is clear of obstructions that may be ignited or damaged by the hot exhaust gases.

_____ (4) Verify that ear protection is worn by all in test cell.

_____ (5) Verify that serviceable fire extinguisher is available at unit.

_____ (6) Empty both cylinders to 0 psig.

_____ (7) Close the valve to cylinder number 2. Ensure that the nitrogen engage switch and low purity override switch are OFF.

_____ (8) CLOSE fluid drain valves (V9, 10, 11), hydraulic warming valve (V8), and the storage cylinder drain valves (V5 & V7).

_____ (9) OPEN membrane drain valve (V16) one turn.

_____ (10) Turn Selector valve (V1) OFF and CLOSE the external shutoff valve (V2).

_____ (11) CLOSE low and high pressure regulators (PRV1 & 2), do not over tighten, finger tight only.

_____ (12) OPEN receiver valve V4 and CLOSE receiver valve V6.

_____ (13) Turn OFF power switch (CB1), emergency stop pushbutton (PB1 – **ROTATE CLOCKWISE**), engine ignition switch (SW3), panel light switches (SW1 & 2), and system engage (SW5). Ensure override switch (SW4) cover is closed and safety wired.

4.3 **SAFETY SYSTEM CHECKOUT**

_____ (1) Start the diesel engine.

_____ (2) Listen for abnormal sounds, exhaust smoke, knocks, or other signs of wear.

_____ (3) Observe all meters for movement. Ensure that Check %Nitrogen Display (AE1) reads 77 to 81%.

_____ (4) Remove GANG from operation IAW WP 005, Paragraph 27 of TM 1-3655-230-12.

_____ (5) Inspect GANG for coolant, oil, hydraulic, and fuel leaks.

_____ (6) Start the GANG and allow the GANG to run for a minimum of 2 minutes. Verify operation of the emergency shut down system IAW WP 005, Paragraph 28 of TM 1-3655-230-12.

_____ (7) Start the GANG and allow the GANG to run for a minimum of 2 minutes. Verify operation of the fault safety shut down systems IAW WP 005, Paragraph 28.1 of TM 1-3655-230-12.

4.4 **OPERATIONAL TEST PROCEDURE**

_____ (1) Empty both cylinders to 0 psig.

_____ (2) Close the valve to cylinder number 2. Ensure that the nitrogen engage switch and low purity override switch are OFF.

_____ (3) Switch the main circuit breaker ON. Start the diesel engine and record the time, _____.

_____ (4) When the purity light comes on, membrane pressure (P12) is at least 195psi (200 psi preferred), and the membrane temperature (T12) reaches 110 to 130° F, turn the nitrogen engage switch (SW5) ON.

_____ (5) When cylinder number 1 reaches 4000 psig, record the time, _____, and immediately close the valve to cylinder number 1 and open the valve to cylinder number 2 . Verify that the GANG pressurized number 1 cylinder from 1 to 4000 psig of 95.5% purity nitrogen within 60 minutes of starting the diesel engine. Time = _____ minutes.

_____ (6) When cylinder number 2 reaches 4000 psig, record the time, _____, and immediately open the valve to cylinder number 1. Verify that the GANG pressurized number 2 cylinder from 1 to 4000 psig of 95.5% purity nitrogen within 85 minutes of starting the diesel engine. Time = _____ minutes.

_____ (7) Continue operation until the booster compressor is shut down by the pressure switch and record the pressure on cylinder 2, _____, and cylinder 1, _____. Turn the nitrogen engage switch OFF.

WARNING

If cylinder pressure exceeds 4500 psig, immediately turn the nitrogen engage switch (SW5) OFF.

Refer to TM for troubleshooting.

_____ (8) Reduce the engine speed to 1500 rpm and stop the engine. Switch the main circuit breaker OFF.

_____ (9) Take a nitrogen sample from the cylinder and analyze for nitrogen, water, and total hydrocarbon content.

5.0 **POST TEST**

5.1 **SYSTEM SHUTDOWN.**

_____ (1) Read and record in Table 2.1 the engine and booster compressor hour readings.

ACCEPTANCE TEST COMPLETED

GANG SERIAL NO. _____

Performed by: _____ Date: _____
Stamp

Accepted by: _____ Date: _____
Stamp

6.0 QUALITY ASSURANCE (QA)

6.1 QA IN-PROCESS INSPECTION

Performed by: _____ Date: _____

Stamp

6.2 QA OPERATIONAL TEST PROCEDURE

_____ (1) Verify that the GANG pressurized number 1 cylinder from 1 to 4000 psig of 95.5% purity nitrogen within 60 minutes of starting the diesel engine.

_____ (2) Verify that the GANG pressurized number 2 cylinder from 1 to 4000 psig of 95.5% purity nitrogen within 85 minutes of starting the diesel engine.

6.3 QA FINAL INSPECTION

Performed by: _____ Date: _____

Stamp

_____ (1) Verify that the nitrogen sample is acceptable.

15, **MINIMUM ZERO-HOUR REBUILD REQUIREMENTS**.

NOTE

Great care and effort are required in all cleaning operations. The presence of dirt and foreign material is a constant threat to satisfactory engine operation and maintenance. After cleaning**,** all parts subject to rusting must be lightly oiled and wrapped. Oil passages must be clean and free of any obstructions.

a. Hardware. All corroded hardware shall be replaced with new. All threaded holes shall be inspected for damage and tapped. Repair any damaged threaded holes. Any locking device (such as lock washers, lock nut) that is removed will not be reused and shall be replaced with new.

b. Painting. Paint Sand #33303 color. Do not paint OEM nameplate, fuel line hoses, water connections, electrical terminals, pulley grooves, belts, glow plugs, exhaust manifold, heaters, electronic sensors and switches, and flywheel mating surfaces. All openings shall be sealed or capped.

c. Contractor Inspections: Cylinder block, cylinder head, connecting rods, crankshaft, and camshaft shall be inspected by a Level II or III Contractor certified non-destructive test (NDT) inspector, utilizing a certified Quality System.

d. Engine: The entire engine shall be disassembled, cleaned (to include removal of all paint and rust), and inspected. Components determined to be non-repairable shall be replaced with new. Upon Contractor acceptance, all components shall be machined in accordance with OEM specifications as required. Upon assembly, all wearable items, such as non-metallic hoses, gaskets, o-rings, seals, expansion plugs, lifters, bearings, bushings, pistons, piston rings, valve guides, and valve spring retainers shall be replaced with new OEM material. All additional parts specified by the OEM to be replaced shall be replaced. All flywheel bolts shall be replaced with new.

(1) Cooling System. Water pump, thermostat, hoses, and belts shall be replaced with new OEM material.

(2) Fuel System. Remanufacture all fuel injectors and fuel injection pump or supply new. Replace all filters, seals, gaskets, o-rings, injector nozzles, metering valves, governor springs, and non-metallic hoses. Each component shall be remanufactured and tested by an OEM certified technician.

(3) Lubrication System. Filters, gaskets, seals, and o-rings shall be replaced. Check oil pressure relief valve in accordance with OEM specifications. The oil pump shall be remanufactured in accordance with OEM Technical Manual or supplied new.

(4) Air Intake and Exhaust System. Gaskets, seals, and hoses shall be replaced. The exhaust manifold shall be free of rust and carbon. Test glow plugs in accordance with OEM specifications and replace as required.

(5) Electrical System. The starter and alternator shall be remanufactured and tested or each item may be supplied new. Replace all brushes, seals, gaskets, bushings, and bearings.

(6) Cylinder Head. Remanufacture in accordance with OEM Technical Manual. Each cylinder head shall be Non-Destructive Test (NDT) inspected by a Contractor certified inspector. As required, resurface the cylinder head mating surface to accept proper sealing of new head

gasket. All valves and valve seats shall be re-machined or replaced. All replaceable guides shall be replaced 100%; all others can be knurled or bushed. Valve spring tension and free length shall be measured. Replace as required. Assemble components and test the valve and valve seat using a vacuum pump maintaining a minimum of 25 in.HG.

(7) Engine Block. Remanufacture in accordance with OEM Technical Manual. Each cylinder block shall be NDT inspected by a Contractor certified inspector. On engines without liners, the cylinder bore shall be bored and honed to OEM specifications. Engines with liners shall have all parent bores machined and liners replaced with new. As required, resurface the cylinder block mating surface to accept proper sealing of new head gasket. Dimensionally inspect all lifter bores for size and visually inspect for signs of pitting, gouging, or scoring. Install main caps and torque to required torque. Measure each main saddle. Machine main bore as required. Install new freeze plugs and cam bearings.

(8) Connecting Rods. Each connecting rod shall be NDT inspected by a Contractor certified inspector. As required, big end shall be resized and machined to OEM specifications. Pin bushing shall be replaced and sized to OEM specifications. The connecting rod shall be inspected for twist and bend dimension as well as center-to-center length.

(9) Crankshaft and Camshaft: Each crankshaft and camshaft shall be NDT inspected by a Contractor certified inspector. Upon Contractor acceptance, each journal and/or lobe shall be micro-polished and measured for dimensional acceptance. Journals may be ground if scored or out of dimension. Ra surface finish on journals shall be within OEM specification.

e. Engine Dynamometer Testing: The Contractor shall perform a dynamometer test on every engine. Engine diesel fuel supplied to the engine during dyno testing shall be filtered IAW OEM specifications. Testing of completed engines will be in accordance with OEM Technical Manual and below paragraphs a. to c. Test reports by engine serial number shall be completed for each engine. Test report shall be provided upon delivery of the engine and shall be attached to each engine.

(1) Dynamometer Test Run Profile: Start engine and run at loads and speeds shown below for the time limits given.

(a) Idle at no load for 2 minutes.

(b) Fast idle at no load for 3 minutes.

(c) Rated speed at ½ load for 60 minutes

.

(d) Rated speed at ¾ load for 40 minutes

(e) Rated speed at full load for 15 minutes.

(2) Measure and record oil pressure, oil temperature, water temperature, speed, and torque during each interval.

(3) Oil Seal and Gasket Leakage. There shall be no leakage permitted.

16. DA FORM 2404, EQUIPMENT INSPECTION, AND MAINTENANCE WORKSHEET.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see DA PAM 738-750 and 738-751; the proponent agency is DCSLOG

1. ORGANIZATION					2. NOMENCLATURE AND MODEL	
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a – Enter TM item number.
COLUMN b – Enter the applicable condition status symbol.
COLUMN c – Enter deficiencies and shortcomings.
COLUMN d – Show corrective action for deficiency or shortcoming listed in Column c.
COLUMN e – Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X" – Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X" – Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed locally, until corrective action can be accomplished.

HORIZONTAL DASH "(-)" – Indicates that a required inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)" – Indicates a material defect other than a deficiency which must be corrected to increase efficiency or to make the item completely serviceable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL - Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT - Status symbols will be recorded in red.

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE *(Person(s) performing inspection)*	8b. TIME	9a. SIGNATURE *(Maintenance Supervisor)*	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. *a*	STATUS *b*	DEFICIENCIES AND SHORTCOMINGS *c*	CORRECTIVE ACTION *d*	INITIAL WHEN CORRECTED *e*

DA FORM 2404, APR 79 Replaces edition of 1 Jan 64, which will be used USAPPC V1.10

TM ITEM NO. *a*	STATUS *b*	DEFICIENCIES AND SHORTCOMINGS *c*	CORRECTIVE ACTION *d*	INITIAL WHEN CORRECTED *e*

USAPPC V1.10

17. POINTS OF CONTACT (POC).

a. AGSE POC is Mr. Rod Bellows, SFAE-AV-AS-AG, DSN 788-9947, commercial (256) 842-9947, e-mail roderick.bellows1@us.army.mil.

b. Logistics POC is Mr. Ed Cholewa, AMSAM-MMC-AV-SA, DSN 897-1575, commercial (256) 313-1575, e-mail cholewaem@redstone.army.mil.

c. Engineering POC is Mr. Kevin Alexandre, SFAE-AV-AS-AG, DSN 788-0495 or commercial (256) 842-0495, e-mail kevin.alexandre@us.army.mil.

18. REPORTING OF ERRORS AND RECOMMENDED IMPROVEMENTS. You can help improve this bulletin. If you find mistakes or know of a way to improve procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, Al 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our fax number is: DSN 788-6546 or Commercial (256) 842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this bulletin. For the World Wide Web use: https://amcom2028.redstone.army.mil.

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0809206

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 314134 requirements for TB 1-3655-230-20-1.

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: “Whomever” whomever@wherever.army.mil
To: 2028@redstone.army.mil

Subject: DA Form 2028

1 ***From: Joe Smith***
2 *Unit: home*
3 ***Address: 4300 Park***
4 ***City***: Hometown
5 ***St: MO***
6 ***Zip: 77777***
7 ***Date Sent***: 19--OCT--93
8 ***Pub no***: 55--2840--229--23
9 ***Pub Title: TM***
10 ***Publication Date***: 04--JUL--85
11 *Change Number*: 7
12 *Submitter Rank*: MSG
13 ***Submitter FName***: Joe
14 *Submitter MName*: T
15 ***Submitter LName***: Smith
16 ***Submitter Phone***: 123--123--1234
17 ***Problem: 1***
18 *Page: 2*
19 *Paragraph: 3*
20 *Line: 4*
21 *NSN: 5*
22 *Reference: 6*
23 *Figure: 7*
24 *Table: 8*
25 *Item: 9*
26 *Total: 123*

27 ***Text***:
This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS

For use of this form, see AR 25--30; the proponent agency is ODISC4.

Use Part II (*reverse*) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)

DATE
8/30/02

TO: (*Forward to proponent of publication or form)(Include ZIP Code*)
Commander, U.S. Army Aviation and Missile Command
ATTN: AMSAM--MMC--MA--NP
Redstone Arsenal, AL 35898

FROM: (*Activity and location)(Include ZIP Code*)
MSG, Jane Q. Doe
1234 Any Street
Nowhere Town, AL 34565

PART 1 - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 9-1005-433-24	16 Sep 2002	Organizational, Direct Support, And General Support Maintenance Manual for Machine Gun, .50 Caliber M3P and M3P Machine Gun Electrical Test Set Used On Avenger Air Defense Weapon System

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON
1	WP0005 PG 3		2			Test or Corrective Action column should identify a different WP number.

* *Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788-1234	

TO: (Forward direct to addressee listed in publication)	FROM: (Activity and location) (Include ZIP Code)	DATE
Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	8/30/02

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS (*Any general remarks or recommendations or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.*)

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788-1234	

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS **For use of this form, see AR 25--30; the proponent agency is ODISC4.**	Use PartII(*reverse*) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE
TO*: (Forward to proponent of publication or form)(Include ZIP Code)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	FROM*: (Activity and location)(Include ZIP Code)*	

PART 1 --ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON

* *Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	**FROM:** *(Activity and location) (Include ZIP Code)*	**DATE**

PART II --REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

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PART III --REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C